USDA ▪ Forest Service
forest insect & disease management methods application group
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May 1984 (18)

NEWSLETTER

ON THE MOVE AGAIN

Once again the offices of FPM/MAG are moving, but for a considerably shorter distance this time. As of April 1, MAG will be located at 3825 East Mulberry, Fort Collins, CO 80524. This is the same building which houses the Fort Collins Computer Center, several other Washington Office detached field units, and research work units of the Rocky Mountain Forest and Range Experiment Station.

Our new mailing address (which will be reflected in our next Newsletter's letterhead) is:

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MOUNTAIN PINE BEETLE IMPACTS

Significant progress has been made in implementing the first year's activities of the 5-year plan for assessing impacts of mountain pine beetle in lodgepole pine as part of the Integrated Pest Impact Assessment System (IPIAS):

A steering committee has been organized to oversee the implementation of the 5-year plan. Major functions of this committee will be to provide overall program direction, determine program dimensions, and insure program integrity. In addition, the committee will serve as a forum where program results can be presented and user input obtained and evaluated.

Bill White of the MAG staff will serve as Program Leader. His primary tasks will be to provide overall coordination and administrative and fiscal support for all aspects of the five year project, in addition to chairing the IPIAS steering committee.

Greg Buhyoff, Virginia Polytechnic Institute and State University, (VPI), and Terry Daniel, University of Arizona, have been selected to serve as operations coordinators. They will provide overall scientific guidance, review individual project methodology and results, insure capability of results between projects, and identify opportunities to share data gathering between individual projects.

Don Hunter, U.S. Fish and Wildlife Service, Western Energy Land Use Team, (WELUT), will coordinate the computer system aspects of the program. His responsibilities will include establishing hardware and software systems requirements, reviewing computer programs, linkage and documentation for overall compatability among the various projects.

The principal users group will assure user input into IPIAS design as well as insure applicability to on-line forest planning and management activities. Members will also function as an oversight group. As of this writing, Dave Holland, of the Intermountain Region in Ogden; Tom Hofacker, of the Washington Office; and Paul Buffam, Director of Forest Pest Management for the Pacific Northwest Region in Portland; have been officially asked to serve on this group. Additional names are still under consideration.

The principal investigators group will participate in designing IPIAS components as well as in the testing and documentation of the final system. This type of a structuring will require an exchange of information and ideas between the various principal investigators.

The first session of this group was held after the Western Forest Insect Work Conference in Eugene, Oregon, on March 9. At this session we reviewed the three projects which are underway to date:

A Cooperative Agreement with VPI with principal investigators Greg Buhyoff and Terry Daniel, of the University of Arizona, will, in part, identify the needs of resource specialists in determining impacts of forest pests. Additionally, existing pest, socioeconomic and growth and yield models will be identified and evaluated in light of the needs of resource specialists. This information will allow steering committee members to better develop specifications for future project proposals.

An Intra-Agency Agreement with Intermountain Forest and Range Experiment Station will bring to IPIAS the expertise of Al Stage and Nick Crookston of the Forestry Science Laboratory in Moscow, Idaho, to incorporate the Prognosis growth and yield model and pertinent pest models.

A Memorandum of Understanding between MAG and Area Planning and Development will give us the expertise of Max Keetch, Systems Application Specialist, located in Fort Collins, Colorado. Max will assist us in identifying the capabilities of several major socioeconomic models applicable to IPIAS, plus providing several other technical assistance type tasks.

Another major item covered at the steering committee meeting was to develop the framework and list of attendees for a workshop to draft specifications for a forest contagion model relative to mountain pine beetle and lodgepole pine. We have contracted with the Adaptive Environmental Assessment Group of the U.S. Fish and Wildlife Service, WELUT, to facilitate the workshop. The week of June 25 has been selected for this workshop.

FACTORS AFFECTING B.t. EFFICACY

A statistical analysis using multiple linear regression techniques indicates that application quality and vegetation condition can significantly influence larval mortality resulting from aerial application of pesticides.

In 1981 a pilot control project was conducted in central Montana against western spruce budworm (Stipe et al. 1983). Two commercial formulations of the microbial insecticide, Bacillus thuringiensis (B.t.), Thuricide 16B and Dipel 4L, were applied at 8 billion international units (BIU) per acre (19.8 BIU per hectare) to areas of budworm infestation.

Application quality here refers to the spray density (drops/cm^2), and mass (Mg/cm^2), vegetation condition refers to the ratio of lateral buds which have not opened, or are partially opened. Data on Douglas-fir bud development reported earlier by Dan Twardus of the Pacific Northwest Region in Portland, Oregon, was used in this analysis.

Using linear regression analysis, the spray density and mass were each identified as significant terms in predicting mortality. Bud condition was also significant. The two commercial formulations of B.t. were not significantly different from each other. As the number of drops per cm^2 increased, mortality increased. The rate of increase changed with the mass of B.t. recovered. Phenological development of the vegetation also effected the mortality rate.

The 21 day observation may not be the best criteria for evaluation of a biological agent such as B.t. Some delayed reactions may produce an effective higher mortality rate. It is important that the B.t. be consumed as a viable agent (spores and crystals). Since the viability of B.t. lasts only a few days, the application of the mass into many small drops should increase the chance that the larvae will consume lethal doses of B.t. Treatment following bud burst becomes important for the same reason. It increases the amount of B.t. intercepted by the primary food source and leads to a higher chance that the larvae consumes viable B.t. A prediction equation based on these variables is presented in a soon to be published report.

ROOT DISEASE SURVEY OF DOUGLAS-FIR PLANTATIONS ON THE SIX RIVERS NATIONAL FOREST

The effects of black stain root disease, Ceratocystis (Verticladiella) wageneri, in young plantations, are crown symptoms which include reduction of terminal growth, partial loss of older needles, and gradual fading of foliage color. Some infected trees produce stress cone crops and exhibit basal resinosis.

Black stain disease centers typically appear as groups of dead and symptomatic trees and are usually small, but occasionally may attain a size of up to 10 acres. They are believed to have higher occurrence along roads and there is evidence suggesting that soil disturbance may favor their establishment and development.

Gregg DeNitto, Plant Pathologist, with the Pacific Southwest Region in San Francisco, California, is conducting a survey to determine the incidence of root disease in young Douglas-fir plantations, the amount of mortality, and the relationship of stand management activities on root disease incidence. The survey is being conducted on the Six Rivers National Forest in Northwestern California. Will Hoskins, MAG Statistician, is working with Gregg on the survey design and analysis of the data.

Mention of commercial products does not imply endorsement by USDA.

PEST MODELS - USE IN PLANNING

"Use of Growth and Pest Models for Prescription and Planning" is the title of a paper presented by Michael A. Marsden, MAG's Biometrician, at the symposium, "Silvicultural Management Strategies for Pests of the Interior Douglas-fir and Grand Fir Forest Types". The symposium was held in Spokane, Washington, February 14 - 16, 1984.

The paper discusses two classes of pest models: A pest impact model, a computer program which simulates the changes in tree growth and mortality due to levels of pest activity; and a pest model, a computer program which simulates the population dynamics of the pest and the elements of a pest impact model.

Examples of each class of pest models are presented with an application to a stand prescription. The example for the first class is the calibration of the Prognosis system for stand projection, to the growth rates observed during a western budworm outbreak on the Payette and Boise National Forests. The use of the Douglas-fir tussock moth/Prognosis system is presented as an example of the second class of models. The linking of pest models to the Prognosis system has produced a system of "Growth and Pest Models". The models predict the changes in tree growth and tree mortality in the presence of a forest pest.

The Douglas-fir tussock moth and mountain pine beetle models are already linked to Prognosis and exist in an operational environment. The western budworm model is linked to Prognosis and should be released for use this summer. Other pest options being considered for Prognosis are dwarf mistletoes, larch casebearer, and root diseases.

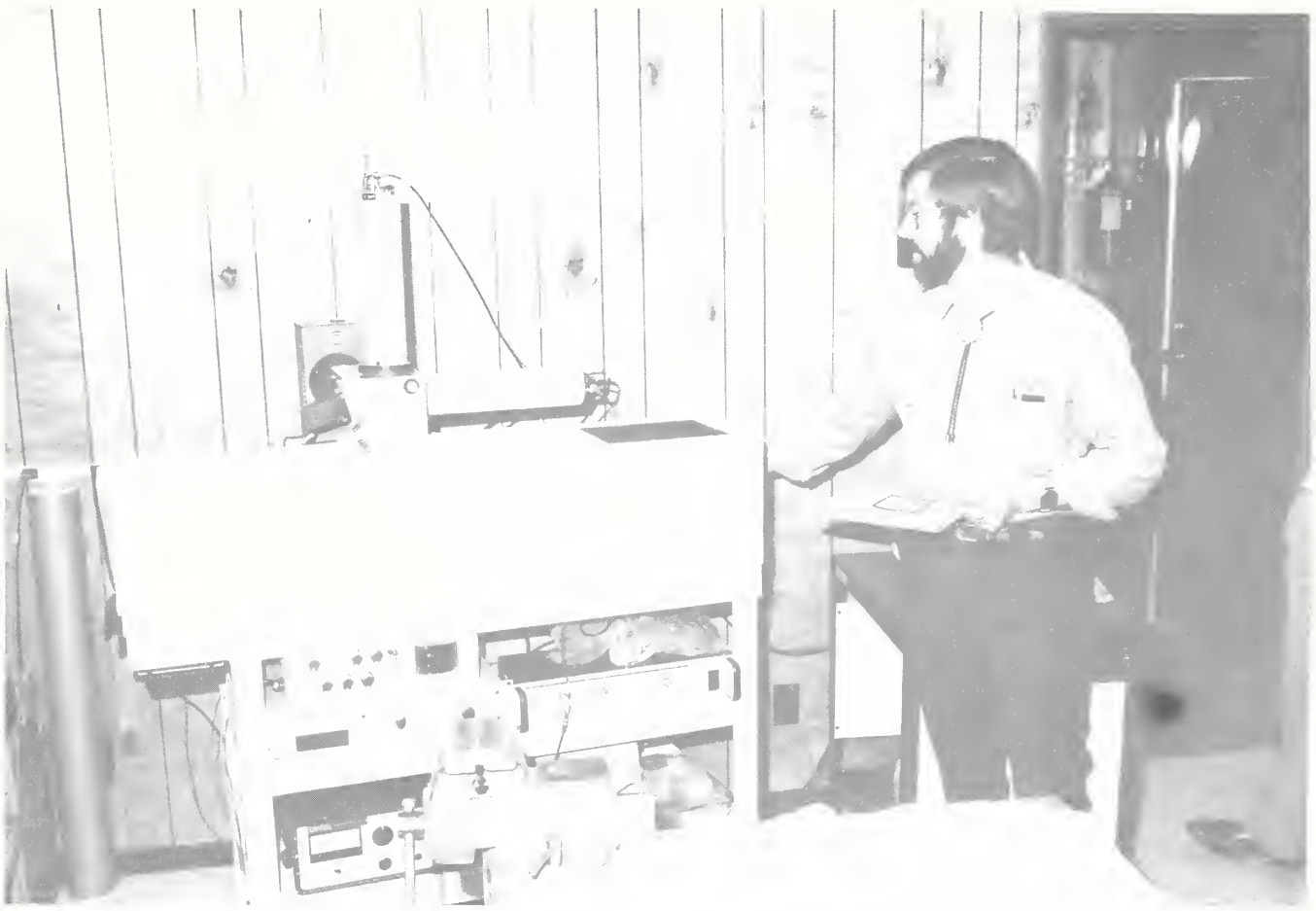
Also included in this paper is a discussion regarding the expansion from stand prescription to the more complex planning processes.

SPRUCE BUDWORM EGG MASS COUNTER

An automated spruce budworm egg mass counter has been developed through the efforts of the CANUSA Spruce Budworm Research and Development Program, Northeastern Forest Experiment Station, University of Maine, and the Missoula Equipment Development Center. The counter works on the principle that recently hatched spruce budworm egg masses flouresce. Branches are placed on a conveyor belt and passed through a beam of ultra violet light. A sensor, calibrated to the wavelengths at which spruce budworm egg masses flouresce, detects and records any object which flouresces in these wavelengths.

At present, two prototypes have been developed; one by the University of Maine, another by the Missoula Equipment Development Center. An early test of the University of Maine prototype showed that a branch sample could be scanned in eight minutes, as opposed to examination by hand which takes at least 30 minutes, with no loss of accuracy. The MEDC version can be adjusted to detect egg masses of eastern or western spruce budworm and it is now ready for a performance test.

Plans are being developed to conduct an extensive performance evaluation of this system using branch samples of several hosts of both eastern and western spruce budworm. Forest pest management teams from eastern Canada, the Northeast Lake States, and Western U.S. will participate, with MAG providing general coordination and assistance in test design and data analysis.



Loren Deland of the Missoula Equipment Development Center demonstrates the Spruce Budworm Egg Mass Counter.

MOUNTAIN PINE BEETLE AND ROOT DISEASE

Mountain pine beetle and root disease caused by the black shoestring fungus, Armillaria mellea, may be closely associated with one another. This is the preliminary finding of a cooperative evaluation recently completed by a team composed of forest pest management specialists from the Forest Service's Rocky Mountain Region in Denver, Colorado; the Rocky Mountain Forest Range and Experiment Station in Fort Collins, Colorado; and MAG. The evaluation was conducted in ponderosa pine forests in the Black Hills of South Dakota where mountain pine beetle has caused losses for many years. The role of Armillaria root disease in predisposing trees to beetle attack was suspected several years ago and further evidence to support this resulted from this evaluation. Comparable results with larger sample size would indicate a statistically significant association between the root disease and mountain pine beetle in large diameter stands. A word of caution - this association has not yet been proven; however, preliminary findings support the merits of a larger and more rigorous survey to show significance.

PANORAMIC AERIAL PHOTOGRAPHY AND OAK WILT

An evaluation of high altitude panoramic aerial photography for mapping oak wilt mortality centers in the Edwards Plateau Region of central Texas is progressing according to schedule. During January 1984, a team of Forest Service photo interpreters met at the offices of the National Forestry Applications Program (NFAP) in Houston, Texas, to complete interpretation of two flight strips taken over areas of concentrated oak mortality. Photo interpreters were Paul Ishikawa of NFAP, Chuck Dull and Emmett Wilson of the Doraville, Georgia Field Office, and Paul Mistretta and Dale Starkey of the Pineville, Louisiana Field Office, Forest Pest Management, Southern Region. The team located oak mortality centers and transferred them to a USGS map base.

The next step in the evaluation is to compare the results of the panoramic aerial photo interpretation with results obtained from interpretation of conventional 9-inch aerial photos taken over the same area. This will be done by digitizing both sets of photo interpretation results into a version of the geographic information system MOSS which resides on the Region 8 Forest Pest Management data management system REMIDAS. Photo interpretation accuracy will be compared by overlay processing.

Chuck Dull of the Doraville, Georgia Field Office locates centers of oak mortality on high altitude panoramic aerial photographs.

Dale Starkey of the Pineville, Louisiana Field Office transfers mortality areas to a map base using a zoom transfer scope.

WESTERN ROOT DISEASE LOSSES SUMMARIZED

Root pathogens are fast becoming recognized as one of the major disease causing agents affecting productivity of commercial conifer forests in the west. In a special MAG report, compiled by Richard S. Smith, Plant Pathologist with the Pacific Southwest Region in San Francisco, estimates of mortality are placed at 237.4 million cubic feet annually. These estimates are based on survey data provided by the six western regions of the Forest Service and may be conservative because some areas have not been surveyed. This estimate accounts for 18 percent of the total tree mortality in the Western United States. Most severe losses are reported for California, Idaho, Montana, Oregon, and Washington.

Five pathogens are responsible for most of the mortality: annosus root disease, Heterobasidion (Fomes) annosus; Armillaria root rot, Armillaria mellea; black stain root disease, Ceratocystis (Verticicladiella) wagneri; brown cubical butt rot Phaelous (Polyporus) schweinitzii; and laminated root rot Phellinus (Poria) weirii. They adversely affect forest resources in many ways - timber production is decreased; timber production costs are increased and management options are reduced; trees are weakened in recreation sites which threaten life and property; and fuel levels are increased and infected trees are predisposed to insect attack.

DECLINE AND MORTALITY OF RED SPRUCE

An increase in the incidence of decline and mortality of red spruce has been reported in several northeastern states. The cause, or causes, of this condition are not fully understood and may be the result of a complex of factors including root disease, wind damage, overmaturity, nutrient imbalances and air pollution.

MAG is working with representatives of the Northeastern Area Field Office in Portsmouth, New Hampshire and Morgantown, West Virginia, and the states of New Hampshire, New York, and Vermont to design and conduct a survey to determine extent and severity of spruce decline and mortality. The survey will include state and private lands in the Adirondack and Tug Hill Plateau Regions of New York and all areas of spruce-fir type in New Hampshire and Vermont except those areas which have been defoliated by spruce budworm. A separate survey will estimate levels of spruce decline and mortality on a stand basis for the Green Mountain National Forest in Vermont, the White Mountain National Forest in New Hampshire, and the Monongahela National Forest in West Virginia.

The survey will consist of blocks of color infrared aerial photography which will be stratified according to the proportion of spruce-fir type and broad levels of decline and mortality. Counts of dead and declining trees will be made on aerial photo plots followed by a ground survey of selected photo plots.

The survey will be conducted over a two-year period. Aerial photo acquisition and photo interpretation will be completed in 1984. Ground surveys will be conducted in 1985.

SPRUCE BUDWORM IMPACT ON THE NICOLET NATIONAL FOREST

Data analysis is in the final stages of completion as part of an evaluation of three survey methods for estimating volume of mortality caused by spruce budworm. The evaluation is being conducted on the Nicolet National Forest in Northeastern Wisconsin. This evaluation was designed to compare survey methods which encompass various statistical procedures as well as information gathering techniques. Random sampling and a sampling scheme which keys on the mortality estimated in earlier stages, e.g., large scale photography, are among some of the techniques under study. A fourth method, using panoramic photography as a first stage, has been eliminated due to flight timing difficulties.

PRESENTATIONS

Bill Ciesla presented a paper entitled "Color and Color-IR Photography for Assessing Forest Pest Management Tactics" at the Ninth Biennial Workshop on Color Aerial Photography in the Plant Sciences in Orlando, Florida, November, 1983.

Bill Ciesla addressed the 10th Annual Meeting of the Western and Central Mosquito Control Association with a paper entitled "Potential Application of Remote Sensing in Mosquito Control".

At the request of the Superior National Forest in Minnesota, Bill White and Don Hunter, WELUT, U.S. Fish and Wildlife Service, presented IPIAS and GIS to about 70 individuals from the Superior National Forest and other Lake States Forests. While in Minnesota Bill and Don presented the same information to faculty and students in the University of Minnesota's Department of Entomology's "Current Topics in Forest Entomology" seminar series.

Closer to home, the MAG and WELUT team presented similar information to the Forest Supervisor of the Arapaho and Roosevelt National Forests and his resource staff. Dick Myhre, of the MAG staff, presented MAG's aerial photo program capabilities.

Dick Myhre attended the annual Society of Range Management meeting held in Rapid City, South Dakota, in February. He presented two displays at the meetings poster session: (1) use of aerial photography for mapping a noxious weed - leafy spurge; and (2) assessing prairie dog problems with aerial photography. While at the meeting, he attended a special Forest Service meeting on prairie dog management, and discussed the current status of aerial photography applications.

Dick Myhre attended the joint annual convention of the American Society of Photogrammetry and American Congress of Surveying and Mapping held in Washington, D.C., in March. He presented a paper entitled "An Aerial Photography Acquisition Program for Forest Pest Management".

PUBLICATIONS

Ciesla, W.M. 1983. The multifaceted control of pests that damage our forests. IN Using Our Natural Resources 1983 Yearbook of Agriculture. USDA, Washington, D.C. pp. 196-203.

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Daniel, T.C., W.B. White, and D.O. Hunter. 1983. Integrated pest impact assessment system: an interface to a forest management information system. USDA Forest Service, Forest Pest Management Methods Application Group, Fort Collins, CO 80526. Rpt. No. 84-2, 22 pp.

Eav, B.B., R.D. Dillman and W.B. White. 1984. High-altitude photography for inventories of mountain pine beetle damage. J. Forestry 82:175-177.

Mielke, M.E., W.M. Ciesla, and R.J. Myhre. 1984. Inventory of beech bark disease mortality and decline on the Monongahela National Forest, West Virginia. USDA Forest Service, Forest Pest Management Methods Application Group, Fort Collins, CO 80526. Rpt. No. 84-4, 15 pp.

Myhre, R.J. 1983. Mapping leafy spurge communities from aerial photography. IN Proceedings of Leafy Spurge Symposium, Sundance, WY, June 1983, pp. 52.

Myhre, R.J. 1984. An aerial photography acquisition program for forest pest management. IN Proceedings of the American Society of Photogrammetry-Technical Papers, 1984 (50th) Annual Meeting, Washington, D.C., March 1984, pp. 395-401.

Smith, R.S. 1984. Root disease-caused losses in the commercial coniferous forests of the western United States. USDA Forest Service, Forest Pest Management Methods Application Group, Fort Collins, CO 80526. Rpt. No. 84-5, 21 pp.

GPO 842-898

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